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Evaluating Long Term Outcomes for Students with Learning Disabilities:

Does Age of First Services Matter?

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Evaluating Long Term Outcomes for Students with Learning Disabilities: Does Age of First Services Matter?

by

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Report

Presented to the Faculty of the Graduate School

of the University of Texas at Austin

in Partial Fulfillment

of the Requirements

for the Degree of:

Masters of Arts

The University of Texas at Austin

August 2011

Evaluating Long Term Outcomes for Students with Learning Disabilities:

Does Age of First Services Matter?

by

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Within the last few decades there has been a push in the field of learning disabilities to identify students who have or who are at risk for learning disabilities as early as possible. Little to no research has been conducted on the long-term effects of age of first service provision for students with learning disabilities, however. Using multiple regression, this study will analyze data from the National Longitudinal Transition Study-2 (NLTS-2) to investigate the potential effects of age of first service provision on high school educational achievement and educational attainment in order to better understand the longer-term effects of the age of identification and age of intervention for students with learning disabilities.

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Introduction

Within the last two decades there has been a push to identify children as early as possible who have or who are at-risk for learning disabilities. Early identification has been emphasized in hopes of providing initial services that could subsequently reduce or eliminate the effects of a child's disability or delay. The No Child Left Behind Act of 2001 (NCLB) and the Individuals with Disabilities Education Act of 2004 (IDEA) both emphasized the early identification of children who are at-risk for learning disabilities and the early provision of evidence-based instruction for these children (NCLB, 2002; IDEA, 2004). There is a wealth of research supporting short-term benefits of early intervention with children at-risk for learning difficulties, especially in reading. However, very little research has focused on whether measurable long-term benefits of early identification and early service provision exist for children with learning disabilities.

Students with learning disabilities now make up over half of students receiving special education in the United States (Fletcher, Lyon, Fuchs, & Barnes, 2007). The majority of students with learning disabilities demonstrate significant reading difficulties, with estimates ranging from 80-90% (Lyon et al, 2001; Shaywitz, Morris, & Shaywitz, 2008). Students who are poor readers early in life are likely to continue to struggle with reading throughout their whole lives, with the achievement gap between them and good readers continuing to grow as schooling progresses (Good, Simmons, & Smith, 1998; Juel, 1988). Stanovich (1986) was among the first to report and label this effect; he referred to this "rich get richer" trajectory as Matthew effects (referring to a New Testament parable in the Book of Matthew), a sociological concept describing the phenomenon wherein children who are good at reading will read more, gaining richer vocabulary and increasing their reading skills, and therefore read even better, while poor readers read less, which hinders further growth in vocabulary and reading skills.

Early educational interventions have shown long-term benefits for non-learning disabled students. A large body of research has investigated the long-term effects of general education and the

effects of early childhood education for children in poverty. Investigations of heterogeneous pre-kindergarten programs have shown that pre-kindergarten or other such early childhood programs can produce beneficial effects on vocabulary, pre-reading, and early math skills across all types of students enrolled. Although these programs may vary in effect size, such findings suggest that early education likely benefits the general population (Wong, Cook, Barnett, & Jung, 2008). Additionally, reviews of numerous studies investigating early childhood programs for children in poverty have indicated that early childhood education can produce short-term effects on cognitive development and persistent long-term effects on achievement, academic success, and other beneficial life outcomes. Children in poverty who have enrolled in early childhood education programs tend to have lower grade retention, lower rates of special education, higher rates of high school completion, and lower rates of juvenile arrest or reported criminal behavior (Barnett; 1995, Barnett, 1998; Reynolds, Temple, Robertson, & Mann, 2001; Garces, Thomas, & Currie, 2000). Although these findings remain somewhat controversial, early childhood educational interventions are widely regarded as an effective strategy for improving long-term outcomes for the general population and for children in poverty, specifically. However, very little research has focused on the long-term effects of educational interventions for other subpopulations, including students with learning disabilities.

The push in recent decades to identify children with learning difficulties as early as possible has largely been in an effort to remediate learning difficulties, close the gap between good and poor readers, and allay Matthew effects. A broad consensus has developed regarding the importance of implementing early interventions for children who demonstrate academic risk with the purpose of improving academic competency and preventing low achievement that likely would lead to a diagnosis of specific learning disability (Lennon & Slesinski, 1999; Perez-Johnson & Maynard, 2007; Reschly, 2005). Cavanaugh, Kim, Wanzek, and Vaughn (2004) conducted a meta-analysis of studies examining the effects of school-based reading interventions for kindergarten students at-risk for reading difficulties;

they found that early interventions appear to be efficacious in preventing reading disabilities. This meta-analysis provides strong evidence supporting the implementation of reading interventions for students at-risk for learning disabilities.

Although there is evidence that early intervention with students at-risk for reading failure confers benefits, research rarely follows students past one or two years; the few longitudinal studies that have been conducted rarely follow students past fifth grade. In fact, very little research has been conducted on adult outcomes of students with learning disabilities. Those studies that have examined adult outcomes have largely focused on what components of transition services provided by schools predict post-high school success (Blalock & Patton, 1996; Brinckerhoff, 1996; Cummings, Maddux, & Casey, 2000). Little research has focused on other educational variables which could affect outcomes in adulthood for students with learning disabilities. Research on learning disabilities, and reading disabilities in particular, is often focused on understanding what must be included in instruction and when instruction should be implemented to be most effective in ameliorating learning difficulties (National Reading Panel [NRP], 2000; Snow, Burns, & Griffin, 1998). However, the long-term effects of age of identification and age of service provision largely have been ignored in research. Further understanding of the long-term benefits of early identification and early intervention would give more depth to current perspectives on learning disabilities and the effect of educational interventions.

Because of the central role that reading plays in education, most studies that have investigated the impact of educational interventions on students with learning disabilities have focused specifically on students demonstrating reading difficulties. Learning disabilities and reading disabilities have been historically difficult to separate (Gresham, 2002); because relatively more is known about reading disabilities, researchers have tended to continue to focus on reading disabilities (Lyon, 1996). Though the majority of students with learning disabilities demonstrate reading difficulties, it is important to break this cycle and understand the effects of learning disabilities beyond just reading difficulties. Thus

in examining the long-term effects of age of identification of learning disabilities and age of first service provision for learning disabilities, this study will focus on students with all types of learning disabilities, not just reading difficulties.

This study will utilize data from the National Longitudinal Transition Study-2 (NLTS-2), a longitudinal study examining multiple aspects of the lives of a nationally representative sample of youth with disabilities over a 10-year period. This study will take advantage of this national picture of the experiences of youth with disabilities as they transition from adolescence into adulthood in order to investigate the effects of age of identification and age of service provision for students with learning disabilities. Using multiple regression, this study will analyze the potential effects of age of first service provision on educational achievement and educational attainment in order to better understand the long-term effects of early versus later identification and intervention.

Integrative Analysis

In order to understand the long-term effects of early intervention for students with learning disabilities, it is important to understand the history and research findings regarding a number of different systems that inform this topic. First among these is the long-term effects of education in general and, more specifically, the long-term effects of early education. Second of these topics is what is known regarding early intervention for students at-risk for or already diagnosed with a learning disability. The third is what is currently known about predictors which lead to post-high school success for students with learning disabilities, specifically research related to transition services. Understanding the histories of and research related to each of these topics is useful because of their continued impact on assessment and intervention practices for students with learning disabilities (Lyon, 1996). The following integrative analysis provides an overview of the literature on these topics.

Educating Students with Disabilities: A Brief History

The history of public education in the United States is one fraught with discrimination and inequality. This is particularly true regarding special education, as students with disabilities have historically received unequal treatment in public education. While compulsory education laws enacted in the early twentieth century began to change the rates at which students with disabilities were admitted to public school, students with disabilities continued to be discriminated against and denied an effective or appropriate education (Yell, Rogers, & Lodge-Rodgers, 1998). To address this, parents and other advocates pushed for and accomplished the passage of much federal legislation over the latter part of the twentieth century that aimed to ensure that students with disabilities were provided educational opportunities equal to those of their non-disabled peers. Having gone through multiple iterations, the most essential laws that govern the education of students with learning disabilities today are the No Child Left Behind Act of 2001 (NCLB) and the Individuals with Disabilities Education Act of 2004 (IDEA). These laws include multiple provisions that seek to ensure that students with disabilities

are provided a free and appropriate public education that includes services that best serve their educational needs. NCLB and IDEA govern how states and public agencies provide early intervention, special education, accommodations, and related services to children and youth with disabilities (for more information, see http://ed.gov/nclb/landing.jhtml and http://idea.ed.gov).

One element currently emphasized in NCLB and IDEA is the need to identify students with disabilities early in order to provide services for those students who need support as early as possible. This focus on early identification of disabilities has increased in the last few decades, following the resurgence in the 1960s and 1970s of using early education as a means for social reform (Yell et al., 1998). The emphasis on early identification and early intervention cannot be understood, however, without understanding what is known about the long-term effects of early education in general. Evaluating what is known about the long-term effects of preschool and early childhood education helps inform the understanding of the potential for early identification and early intervention to help students with learning disabilities.

Effects of Early Education

In the 1960s and 1970s, a number of carefully controlled scientific programs (e.g., Head Start, the Perry Preschool program, the Carolina Abecedarian program, etc.) were implemented to investigate the potential benefits of early childhood education. Though initial studies showed promise, including findings of improved cognitive development, optimism was dampened by further studies which showed that these initial improvements in cognitive development faded within a few years (e.g., Brofenbrenner, 1974; Office of Economic Opportunities, 1969; Smith & James, 1975). However, meta-analyses performed later found effects that endured beyond these initial findings (FPG Child Development Center, 1999; Garces, Thomas, & Currie, 2000; Smith & James, 1975). Lazar & Darlington (1982) found that early child education had lasting effects in four areas: school competence; developed abilities; children's attitudes and values; and impact on the family. Investigations of heterogeneous pre-

kindergarten programs have also shown that pre-kindergarten programs can produce beneficial effects on vocabulary, pre-reading, and early math skills across all types of students enrolled. Although programs and related findings vary in effect size, such findings suggest that early education benefits students (Wong et al., 2008).

Preschool or early educational programs are today nearly unambiguously thought to be beneficial. Numerous studies have found that experiencing a preschool program is related to the following: increased likelihood of high school completion and employment; decreased likelihood of grade retention or being referred to special education; higher achievement orientation and likelihood of being proud of academic achievement; lower levels of delinquent behavior and arrests; higher income and job satisfaction; less dependence on public welfare benefits; and lower instances of teenage pregnancies (Barnett, 1995; Barnett, 1998; Lazar & Darlington, 1982; Schweinhart, 1994; Woodhead, 1985). These findings have suggested that early childhood education is an effective strategy to improve the educational outcomes of the general population and of children in poverty, specifically. A non-experimental long-term follow up of adults who participated in Head Start as children in the 1960s and 1970s demonstrated that social and economic benefits associated with Head Start participation, including higher rates of high school completion, higher earnings, and reduced reports of criminal activities, persist into adulthood (Garces, et al., 2000). Cost-benefit analyses of federally funded preschool programs have demonstrated that public preschool programs can provide economic benefits that far exceed the costs to society (Reynolds, Temple, Robertson, & Mann, 2002; Schweinhart, 1994). Though researchers once claimed that “compensatory [preschool] education has been tried, and it apparently has failed” (Jensen, 1969, p. 1), many researchers now believe that preschool education seems to be “an economically efficient public investment” (Barnett, 1992, p. 280).

Woodhead (1985) posited that long-term benefits associated with participation in early childhood education programs for children in poverty can be accounted for by a transactional model

wherein short-lived improvements in competence coupled with increased motivation, parental aspirations, and school expectations form a mutually reinforcing positive cycle of achievement. Thus, the effects of preschool education on children's development are not thought to be caused by a direct model. Rather, the initial effects of preschool on children are set within a broader social context; these initial effects interact with later life experiences to produce long-term pattern changes (Woodhead, 1985).

Many beneficial effects of early child education have been demonstrated, but studies have focused most specifically on children from low-income or impoverished backgrounds. Children who experience poverty or deprivation in their early years have been found to be especially vulnerable to poor educational and other long-term outcomes (Perez-Johnson & Maynard, 2007). The findings cited above regarding lower grade retention, lower rates of special education, and higher rates of high school completion have a particularly strong relationship to participation in a preschool program for children in poverty (Barnett; 1995, Barnett, 1998; Perez-Johnson & Maynard, 2007; Reynolds et al., 2001). Though there are virtually no differences in cognitive ability among infants of different race or socioeconomic backgrounds, a gap between children from relatively disadvantaged and relatively advantaged outcomes can be seen from a very early age. For the population of children in poverty, early childhood programs have been found to be more effective than remedial education or other responses during the later school years (Perez-Johnson & Maynard, 2007). Little is known, however, about the long-term effects of early education for other sub-populations, including students with learning disabilities. The question remains whether Woodhead's transactional model would function the same for the population of students with learning disabilities.

Across the educational system, there is currently a focus on moving towards early identification of learning disabilities in order to provide services for these students as early as possible. Similar to the history of early education programs, initial findings support the notion that providing services early

leads to benefits (Cavanaugh et al., 2004). However, there is little evidence demonstrating the long-term effects of early identification and intervention for this population. In fact there is concern that public education is not as effective as it should be in teaching fundamental skills, particularly to students with learning difficulties, regardless of when the disability is identified (Torgesen, 2002). Just as early educational programming benefited from an examination of the long-term effects of such programs, so too would the field of special education benefit from an examination of the long-term effects of early identification and early service provision for students with learning disabilities.

Learning Disabilities: Definition and Assessment

Definitions and ambiguities

Before discussing the long-term effects of intervention services for students with learning disabilities further, it is important to understand what a learning disability is and how it is diagnosed. "Learning disability" is a challenging classification because of the lack of unanimity regarding the definition, ambiguities inherent in most definitions, and the extensive and tangled history of the concept of being learning disabled.

Historically, "learning disability" has been synonymous with the concept of *unexpected underachievement*, or the idea that individuals who do not achieve at a level commensurate with their potential are unique in some fashion. Though the concept of unexpected underachievement had been given various labels beginning in the mid-nineteenth century, the term "learning disability" first gained formal recognition in the field of education in the 1960s when coined by psychologist Samuel Kirk (Lyon, 1996; Lyon et al., 2001). Kirk used the term to refer to unanticipated learning problems encountered in a seemingly otherwise capable child. He defined a learning disability as a "a retardation, disorder, or delayed development in one or more of the processes of speech, language, reading, spelling, writing, or arithmetic resulting from a possible cerebral dysfunction and not from mental retardation, sensory deprivation, or cultural or instructional factors" (Kirk, 1962, p. 263).

Many definitions of learning disability have been proposed since Kirk's original 1962 definition. These definitions have included variations in both the characteristics of children identified as learning disabled and the processes that should be used to assess and label those children (Fletcher et al., 2007). The two most widely-used definitions today are those from IDEA and the National Joint Committee on Learning Disabilities (NJCLD; Kavale & Forness, 2000). According to the definitions offered by IDEA and NJCLD, a learning disability is "a generic term that refers to a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, which may manifest itself in the imperfect ability to listen, think, speak, read, write, spell, or do mathematical calculations" (IDEA, 2004, see http://idea.ed.gov; also see NJCLD, 1998). IDEA recognizes the following eight categories of learning disabilities in the areas of reading, writing, and math: oral expression; listening comprehension; basic reading skills; reading fluency; reading comprehension; math calculation; math comprehension; and written expression (IDEA, 2004). The Diagnostic and Statistical Manual of Mental Disorders (*DSM-IV-TR*) states that learning disabilities "are diagnosed when an individual's achievement on individually administered standardized tests in reading, mathematics, or written expression is substantially below the level expected based on age, schooling, or level of intelligence" and when these learning problems "significantly interfere with academic achievement or activities of daily living that require reading, mathematical, or writing skills." According to the DSM, 'substantially below' is usually defined as a discrepancy of more than two standard deviations between IQ and achievement, though a smaller discrepancy is sometimes used (APA, *DSM-IV-TR*, 2000, p. 49-50).

Learning disabilities, or early struggles in reading or learning, are known to predict a number of poor educational outcomes, including severely deficient reading and writing skills throughout elementary school, little to no improvement in secondary school, and a high likelihood of dropping out before graduation (Jenkins & O'Connor, 2002). Demoralization, low self-esteem, and social skills deficits may also be associated with learning disabilities. According to the DSM, the school drop-out rate for

students with learning disabilities is reported to be nearly 40%, which is more than 1.5 times the national average. Also according to the DSM, learning disabilities may persist into adulthood, and adults with learning disabilities may have many significant difficulties with employment or social adjustment (APA, *DSM-IV*-TR, 2000). Poor adult outcomes for individuals with learning disabilities and a lower likelihood of successfully completing adult transitions have also been documented elsewhere (Janus, 2009). Because of these dismal educational outcomes, it is thought that identifying children most likely to encounter reading and learning problems early and providing them with the necessary supports is the first step in reducing the incidence or severity of learning disabilities. However, because schools tend not to identify learning disabilities until at least the middle elementary school grades, children's learning difficulties grow strong roots and may become even more intractable as time goes on (Jenkins & O'Connor, 2002; Lyon, 1996). This notion strengthens the push for increased knowledge about the efficacy of early intervention services.

Wait-to-fail? The controversies of learning disability assessment

The definitions of learning disabilities provided by the DSM, IDEA, and NJCLD are written in fairly vague terms; phrases such as "imperfect ability," "significant discrepancy," or "significant interference" do not specifically communicate how to define, assess, or measure the construct of learning disability. Learning disabilities are thus operationalized in different ways by different school systems and in research criteria. Due to the historical link between the concept of learning disability and the concept of unexpected underachievement, most methods of operationalizing learning disabilities have used some variation of the notion of discrepancy. This has historically included deviation from grade level, deviation between a child's expected and observed grade level after controlling for IQ (expectancy approach), deviation between scores on a student's measures of IQ and achievement (simple difference method), or deviation between aptitude-achievement measures using the parameters of reliability for aptitude, achievement, and the aptitude-achievement difference score (regression discrepancy approach). Each of

these methods of operationalizing the construct of learning disabilities is fraught with conceptual and statistical drawbacks, and none help plan, implement, or evaluate instructional interventions (Berninger & Abbott, 1994; Gresham, 2002).

The history of different models for classifying, defining, and identifying the unobservable construct of learning disabilities employed by different school systems and researchers is long, complex, and filled with controversy. A synopsis of research in this field can be found in Fletcher and colleagues (2007) and a historical description of the assessment process can be found in Gresham (2002); however, both are beyond the scope of this paper. What is important to consider, according to Gresham, is that the multi-step and multi-disciplinary process of assessing learning disabilities is governed by many factors beyond the scope and abilities of a child himself. Different steps in the process are governed by different factors, including *relativity* (whether a child's general education teacher believes he or she can close the gap between the target child and his or her peers with or without assistance), *acceptability* (whether the child's low level of academic performance is acceptable relative to his or her potential or aptitude), and *profitability* (whether special services provided by the school will benefit the child). Additionally at different steps, the decision is guided by local norms, national norms, socio-cultural factors, and other contextual factors (Gresham, 2002). How and when a child is diagnosed with a learning disability depends greatly on factors beyond an individual child's own ability or achievement.

The most recent revision of IDEA in 2004 attempted to address the statistical, conceptual, and methodological flaws inherent in using the discrepancy approach and so many varied factors to identify learning disabilities. IDEA was changed to allow more room for school districts to choose their own process for identifying children as learning disabled. One primary approach includes using Response to Intervention (RTI) as a method of identification. RTI, which has its roots in the study of aptitude by treatment interactions in psychology, is defined as the change in behavior that results from intervention (Fletcher & Vaughn, 2009). RTI is a multi-tiered service delivery system in which schools provide layered

interventions which increase in intensity. Learning disabilities are assessed based on the discrepancy between an individual's achievement pre- and post-intervention, rather than any of the aforementioned discrepancies. If an intervention fails to produce a change in achievement for an individual, that might be taken as an indication of a learning disability (Fletcher & Vaughn, 2009; Gresham, 2002; Office of Educational Research and Improvement, 2004). Today, both discrepancy approaches and RTI are used to identify students with learning disabilities.

The controversy surrounding methods of assessing and identifying learning disabilities largely revolves around the idea that discrepancy models are inherently "wait-to-fail" models. Defining learning disabilities using a discrepancy approach means that a discrepancy must already exist before one can receive services or help for a learning disability. Inherent in any discrepancy approach is a period where parents and teachers must wait for a student to fall far enough behind that he or she is eligible for services. Discrepancies deemed large enough to warrant a diagnosis of learning disability do not typically develop until a child is 8 or 9 years old, or in third or fourth grade. Thus, a student may struggle for many years before his failure is considered great enough to warrant a label of learning disability that would allow him to gain potentially more effective instruction. Because of the effect of years of academic and emotional strain due to failure, it is thought that learning disabilities should be diagnosed before the age of nine in order for intervention results to be successful (Lyon, 1996; Lyon et al., 2001).

RTI was developed as a response to this "wait-to-fail" notion. By implementing school-wide progress monitoring and multiple tiers of intervention, RTI seeks to support students at whatever level of intensity is needed without necessarily diagnosing a disability or waiting for students to fail (Fletcher & Vaughn, 2009; Vaughn & Fuchs, 2003). However, some researchers claim that RTI models, though well-intentioned, currently suffer from a lack of empirical support, especially regarding reliability and validity. Due to a lack of evidence regarding the long-term effects of early identification and the potential negative long-term impact of RTI for students with disabilities, some researchers believe the

switch to RTI is merely a change from “wait-to-fail” to “watch-them-fail” (Reynolds & Shaywitz, 2009). How learning disabilities are assessed, and the resulting implications for intervention, are important considerations in studying the long-term effects of interventions for students with learning disabilities. If early intervention provides long-term benefits, there may be increasing support for RTI or the implementation of services prior to the development of a severe discrepancy. Research related to whether age of intervention predicts long-term success is needed to inform this question.

Reading Disability versus Learning Disability

For numerous reasons, much of the research on early intervention for learning disabilities has focused on students who struggle with reading or who are at-risk for reading disabilities. A majority of students with learning disabilities do demonstrate reading issues; estimates of the percent of students with learning disabilities who struggle with reading range from 80-90% (Lerner, 1989; Lyon et al., 2001; Kavale & Forness, 2000). The ability to read is crucial to learning, as it allows students to achieve three important goals of learning: building knowledge; acquiring information for accomplishing tasks; and deriving pleasure and feeding interests (Jenkins & O’Connor, 2002). Additionally, learning disabilities and reading disabilities have been historically difficult to separate (Gresham, 2002). Research also has focused on deficits in reading skills for three reasons: definitions and assessment of reading difficulties are the most objectively identifiable; the relative importance of reading skills to academic success; and the fact that more is known about reading deficiencies. Thus, research has been stuck in a cycle where more is learned about reading deficiencies because more is known about reading deficiencies (Lyon, 1996; Lyon et al., 2001).

It is known that children who demonstrate reading difficulties early in their school years are likely to continue to struggle with reading throughout their schooling, and indeed, throughout their lives (Good et al., 1998; Juel, 1988). The gap in ability between good and poor readers continues to grow as schooling progresses, making it even more difficult for students with learning difficulties to catch up to

their more-abled peers. Stanovich (1986) referred to this "rich get richer" trajectory as Matthew effects. Referring to a New Testament parable in the Book of Matthew, Matthew effects represent the sociological phenomenon wherein children who are good at reading tend to read more, gaining richer vocabulary and increasing their reading skills, and therefore read even better, while poor readers read less, which hinders further growth in vocabulary and reading skills. In other words, children who demonstrate initial difficulties with reading rarely catch up (Lyon et al., 2001).

Prevention versus Remediation: What is Known about Early Intervention

Because of the notion that poor readers continue to struggle with reading throughout their lives, a broad consensus has developed regarding the importance of early interventions with children demonstrating learning difficulties. Special education programs are ostensibly designed to close academic gaps, but over 70% of students identified as reading disabled in third grade are still identified as such in twelfth grade, regardless of participation in a special education program (Lyon, 1996). Some research has found that placement in special education is associated with a gain of 0.04 standard deviations in reading and 0.11 standard deviations in math (Hanushek, Kain, & Rivkin, 1998). These small gains do not indicate that special education is closing the gap between the academic performance of students with learning disabilities and those of their non-disabled peers. Children with learning disabilities are remaining in special education for lengthy periods of time, which does not serve the original purpose of providing special education.

Many researchers believe that early intervention can improve overall academic competencies and prevent further low achievement that might lead to a diagnosis of learning disability (Reschly, 2005). Explicit, intense, systematic, and developmentally appropriate interventions have been found to be effective in treating learning disabilities when results are measured within a year or two of the intervention (Shaywitz et al., 2008). There is even somewhat of a consensus about what needs to be included in effective instruction in order to best remediate or prevent learning difficulties, and

particularly reading difficulties. This includes explicit instruction in phonemic awareness, systematic instruction in phonics, instructor encouragement of reading fluency, direct instruction of vocabulary, and small-group or differentiated instruction (NRP, 2000). Explicit instruction in these skills at the kindergarten level has been shown to have positive effects in first grade reading skills (Blachman, Ball, Black, & Tangel, 1994; Lyon, 1996).

Both the consensus report from the National Reading Panel (NRP, 2000) and the evidence-based report of the National Reading Council (Snow, Burns, & Griffin, 1998) concluded that reading disabilities can be prevented if children are identified and provided services early. These reports synthesized research showing that explicit teaching of reading skills was especially effective in kindergarten and first grade, while intervention effects diminished when implemented in later grades. Cavanaugh and colleagues (2004) synthesized findings from 27 intervention studies that examined the effects of school-based reading interventions with kindergarten students deemed at-risk for reading difficulties. According to the results of their meta-analysis, there is strong evidence of the efficacy of reading interventions for kindergarten students in preventing reading disabilities, which supports the implementation of reading interventions with students starting from an early age.

Most studies examining the impact of early intervention have followed students for one year; a few have followed students for up to two or three years. However, no studies to date examining the impact of early intervention programs for students with disabilities have followed students for longer than a few years. Just as critics of early education programs noted that cognitive development improvements faded within a few years, critics of early intervention have suggested that the benefits may fade in later grades (Lyon et al., 2001). Research is needed to investigate this issue.

While there is somewhat of a consensus about what must be included for effective intervention, there is still much controversy regarding the identification of need for services and the timing of intervention programs. Changes to IDEA in 2004 allowed for movement away from the discrepancy

model of identifying learning disabilities and towards RTI models; however, many researchers and practitioners believe there is a paucity of empirical support for RTI. Researchers have worried that "models are being put into practice without adequate research and logistical support and neglect the potential negative long-term impact on students with disabilities" (Reynolds & Shaywitz, 2009, p. 130). The goal of understanding learning disabilities and of designing early intervention programs for students with learning disabilities is to provide the most effective instruction possible in order to ameliorate the disabling effects of and poor long-term outcomes for students with learning disabilities (Fletcher et al., 2007). Understanding the long-term outcomes related to early intervention programs is a crucial next step in continuing to build knowledge about effective intervention programs and effective timing for students with learning disabilities.

Research findings have indicated that students who do not receive early interventions continue to struggle with reading disabilities their entire lives. Some researchers believe that unless identified early on and taught explicit and intensive approaches to learning by specially trained teachers, students who demonstrate learning deficits in third grade will continue to learn poorly throughout middle and high school. This finding is supported by such statistics as the fact that 74% of youngsters who demonstrate reading disabilities in third grade continue to struggle with reading in ninth grade (Lyon, 1996). However, no studies to date have investigated adult outcomes for students who do receive early intervention. Knowing how students who receive early intervention services fare in adulthood is a crucial piece of information in supporting or refuting the value of early identification and intervention with this population.

Transition Services

Long-term outcomes for students with disabilities are related to another type of intervention program: transition services. Transition services have been investigated as a predictor of long-term success for students with disabilities. Transitioning from the protected life of a child to the autonomous

and independent life of an adult is a crucial task for all adolescents (Hudson, 2003). Among other recent social shifts, an increasing emphasis on post-secondary education and the growing struggles post-adolescents face in becoming economically self-sufficient has led to an increased focus on the period of "early adulthood" that is distinct from both adolescence and full adulthood (Newman, Wagner, Cameto, & Knokey, 2009). The gradual acquisition of rights, privileges, and responsibilities that is inherent in transitioning to early adulthood cannot be taken for granted for students with learning disabilities as this increasing degree of independence is sometimes denied to or postponed for individuals with learning disabilities (Hudson, 2003).

The transition from school to early adulthood is a difficult process for all students. This process is even more difficult for students with reading and writing challenges, who have to go through the same college or job application process as other students but with more limited resources. Yet this area is not often addressed in research or practice. In fact, the recognition that learning disabilities are a lifelong condition that affects further education, employment, and career development has only been emphasized in the last few decades (Cummings et al., 2000; Sitlington, 2008). However, studies have found that young people with disabilities, including learning disabilities, are much less likely than their non-disabled peers to have completed aspects of the transition to adulthood, including finding full-time employment, establishing an independent residence, and marrying or having children (Janus, 2009).

Lack of post-secondary education planning may be one reason students with learning disabilities demonstrate inadequate post-secondary adjustment problems (Cummings et al., 2000). Students with learning disabilities may have little understanding of how their disability affects their learning or how to describe it to others. Because employers may be uninformed about learning disabilities and their implications, as well as the fact that learning disabilities cannot necessarily be seen from the outside, individual self-understanding and self-advocacy is especially important for positive post-secondary outcomes (Gerber & Price, 2003). However, years of academic struggles lead to an increasing likelihood

of low self-concept and thinking that one lacks strengths or abilities in many areas, which decreases the likelihood of self-advocacy (Brinckerhoff, 1996). Many students with learning disabilities are not encouraged, assisted, or prepared to consider post-secondary educational outcomes, which leads to a gaping discrepancy between students' declared preferences regarding post-secondary options and their realities (NJCLD, 1994).

Transition services are meant to serve as a coordinated set of services with the aim of facilitating and promoting movement from school to post-school services. Since the 1997 re-authorization of IDEA, transition planning has been a required part of the individualized education programs (IEPs) for all secondary school students with disabilities beginning at age 14 (Cameto, Levine, & Wagner, 2004). However, transition services for students with learning disabilities may suffer for many reasons. One reason is that transition planning often focuses on employer or school needs rather than individual student needs or preferences. The student is the key ingredient in successful transition services; that student must master critical study skills, learning strategies, and daily living and vocational skills in order to succeed in the adult world. If transition services do not focus on student needs, students are less likely to be motivated to work to acquire the skills necessary to move them through the school-determined track. Transition services also may fail because they are not required until the age of 14, which may be too late for many students to gain necessary skills (Cummings et al., 2000).

Inadequate transition planning may lead to adjustment problems post-high school, whether that adjustment is to employment or to post-secondary education. Individuals with learning disabilities tend to demonstrate a slower rate of career maturity, which can include unrealistic job expectations, inappropriate career goals, low self-esteem, learned helplessness, and lack of consideration regarding personal functional strengths and weaknesses. Students with learning disabilities are also less likely to demonstrate self-advocacy, as they tend to be less aware of their personal strengths and limitations or how personal characteristics relate to career choice, making it hard to formulate realistic and

appropriate transition service goals (Brinckerhoff, 1996; Cummings et al., 2000). Research on post-secondary outcomes has largely focused on whether transition services or other high school or college variables can predict or enhance success. The question remains whether early intervention may alleviate both learning difficulties and co-morbid low self-esteem or academic self-competencies leading to greater post-secondary success.

Summary: Why Investigate Longitudinal Outcomes of Early Intervention?

In 1975, only about 20% of children with disabilities were educated in a regular, public school; today the overwhelming majority of students with disabilities (96%) are enrolled in public schools alongside their non-disabled peers (AYPF & CEP, 2001). The changes that have occurred in the education of students with learning disabilities over the last century have been hard-fought and largely successful in applying the right of a free and appropriate public education to students with disabilities. It is now time to look beyond ensuring access and to move towards focusing on improving educational quality and results for students with learning disabilities. Students with disabilities remain nearly twice as likely as their non-disabled peers to drop out of high school and are less likely to enter post-secondary education; those students with disabilities who do start college are still less likely to graduate than their non-disabled peers (AYPF & CEP, 2001).

According to a 2010 report from the Department of Education, 46% of children identified for services under IDEA and known to be enrolled in school four years prior graduated high school with a regular diploma in 2005; the graduation rate for the total population who received a regular diploma that year was 75%. Thus the graduation rate for students receiving services through IDEA was 29 percentage points lower than for the general population (Blackorby et al., 2010). Other analyses deliver a somewhat more positive view, especially when concentrating specifically on students with learning disabilities. Of students enrolled in eighth grade in 1988, 84% of students without a disability received a high school diploma and 6% were known to drop out. For students with a learning disability enrolled in

eighth grade in 1988, 71% received a high school diploma and 12% were known to have dropped out (NCES, 1999). Although these numbers suggest a somewhat more optimistic view than those that reflect students with disabilities as a total group, it still indicates that students with learning disabilities are twice as likely to drop out of high school as students with no documented disability.

Several positive post-high school outcomes have been found to be associated with completing high school, specifically for youth with disabilities, including enrolling in post-secondary educational institutions and using financial tools such as checking accounts, saving accounts, and credit cards (Newman et al., 2009). Thus, it is known that completing high school is associated with many positive outcomes, but that students with learning disabilities are less likely to graduate from high school with a regular diploma. This study seeks to address one part of the question of how to best prepare students with disabilities for successful post-high school outcomes.

Research has found that nearly three-fourths of students identified as having a learning disability in third grade still demonstrate reading disabilities in the ninth grade and beyond, regardless of whether special education was provided (Lyon, 1996). However, many of these students received interventions only after they had been failing in reading or other learning abilities for two or more years. Thus, the lack of success of these interventions may be due to any number of reasons, including declining student motivation, impaired self-concept, or other factors beyond the validity of the intervention program itself. The task of remediation of learning disabilities is thought to become more difficult the longer children go without proper identification and intervention (Lyon, 1996). It is important to understand whether early identification and early intervention can help students with learning disabilities succeed in their later school and post-school lives.

A primary purpose of the provision of a free and appropriate education in IDEA and the requirement of transition planning for students with disabilities is to prepare children and youth with disabilities for employment and independent living (Cameto et al., 2004). The purpose of emphasizing

the early identification of and early intervention with students at-risk for learning disabilities is to prevent further learning deficits in order to boost the achievement of students with learning disabilities and help them perform at levels tantamount to their non-disabled peers. A great deal is known about the long-term effects of early education for children in poverty and about the short-term effects of early intervention with students with learning disabilities. However, less is known about the long-term effects of early education for other sub-populations, such as students with learning disabilities; research has not yet looked at the question of long-term effects of early interventions with these students. The purpose of this study is to investigate the possible effects of age of first intervention services as related to long-term outcomes. Does age of intervention affect the success of the education system in preparing students with learning disabilities for employment and independent living? This study seeks to fill this gap in the literature through addressing this question.

Proposed Research Study

Statement of Problem

Research on the effects of education has indicated that early childhood education can produce significant positive short-term effects on cognitive development and long-term effects on academic achievement and academic success (Barnett, 1995; Barnett, 1998). Improvements associated with early childhood education have been demonstrated to a substantial degree with the general population and for children in poverty, specifically. However, very little research has investigated the long-term effects of education for students with learning disabilities. Research has indicated that students who demonstrate learning difficulties early in life not only continue to lag behind their peers for most of their schooling, but that the gap between normative and poor learners continues to grow as schooling progresses (Good et al., 1998; Juel, 1988). A number of poor educational outcomes, such as low achievement and dropping out of school, are known to be associated with disability status (Lyon, 1996).

There has been a push in recent decades to identify children with learning difficulties as early as possible in order to remediate learning difficulties and preemptively close the gap between good and poor learners. Early interventions for students at-risk for learning disabilities have been found to improve academic competency in the short-term and prevent short-term low achievement that may later lead to the diagnosis of a specific learning disability (Cavanaugh et al., 2004; Lennon & Slesinski, 1999; Perez-Johnson & Maynard, 2007; Reschly, 2005). Lyon (1996) argued that the longer children with learning disabilities go without identification and intervention, the more difficult the task of remediation becomes and the harder it is to find measurable responses in students. However, there are few data on the effect of early interventions with students at-risk for learning beyond one or two years post-intervention. Little is known about the long-term effects of early educational interventions or about adult outcomes of students with learning disabilities.

The purpose of this study is to investigate whether age of first service provision for students with learning disabilities may affect long-term outcomes in terms of educational achievement and educational attainment. This study will use data from the National Longitudinal Transition Study-2 (NLTS-2) to examine the potential effects of age of identification and age of service provision on educational achievement, high school completion, and enrollment in post-secondary education. This study will utilize multiple regression and logistic regression to determine whether age of first service provision predicts students' success in high school, graduating from high school, and pursuing educational opportunities.

Statement of Research Questions and Hypotheses

Research Question 1. What is the relation between the age of identification of learning disabilities and the age which students with learning disabilities first receive special education services?

Hypothesis 1. The age a student is identified as having a learning disability and the age he or she receives services will be strongly and positively correlated. The average difference between these two constructs will be small.

Rationale 1. Schools are required to provide a free and appropriate education to all students. If a student is identified as having a learning disability, that student's school is required to develop an Individualized Education Plan (IEP) for that student and to provide services that best fits the individual's educational needs (IDEA, 2004). This study will focus largely on age of first service provision, but the correlation between the age of identification of a learning disability and the age of first service provision will be examined in order to better understand factors which could affect the age of first service provision. The average difference between these two variables will also be determined to further understand this relationship. Because of the federal mandate that schools provide appropriate services for all students with learning disabilities, including early intervention for students below the age of 6, it

is expected that the correlation between age of identification and age of service provision will be strong and positive and that the average difference will be small.

Research Question 2: Accounting for race, gender, socioeconomic status, and initial ability, what is the effect of the age at which students with learning disabilities first receive services on educational achievement in high school?

Hypothesis 2. Controlling for demographic variables, earlier intervention will lead to higher achievement, as measured by grades from high school transcripts.

Rationale 2. According to the NLTS-2 Technical Work Group, early identification of a disability indicates that the disability affected functioning early in the developmental process, whereas later identification suggests some degree of development occurred without the effects of a disability. Reports from the NLTS-2 have posited that, on average, youth whose disabilities were identified at an earlier age are expected to encounter greater challenges to achievement (Wagner et al., 2003). This may not be as true for youth with learning disabilities, as many researchers hypothesize that early identification may lead to earlier educational help which could lead to better achievement outcomes (Cavanaugh et al., 2004; Lyon, 1996; Lyon, et al., 2001; Reschly, 2005).

Research has shown that early, explicit, systematic interventions have been successful in preventing instances of learning disability diagnoses and aiding student achievement (Cavanaugh et al., 2004; NRP, 2000; Snow et al., 1998). Woodhead's transactional model of early education (1985) posited that short-lived improvements in competence form a mutually reinforcing positive cycle of achievement, which leads to better outcomes. Early intervention is thought to lead to higher achievement in the short-term, which in turn can lead to higher competence, which leads to further positive achievement. Researchers believe that short-term gains may lead to a mutually-reinforcing cycle of long-term achievement; therefore, it is expected that earlier service provision will lead to higher achievement in high school.

Research Question 3: Accounting for race, gender, socioeconomic status, and initial ability, what is the effect of the age at which students with learning disabilities first receive special education services on educational attainment?

Hypothesis 3. Controlling for demographic variables, earlier intervention will lead to greater attainment as measured by high school completion, pursuing post-secondary education, and intensity of pursuing post-secondary education.

Rationale 3. Again, Woodhead's transactional model of early education (1985) posits that short-term achievements coupled with increased motivation, parental aspirations, and school expectations form a mutually reinforcing cycle of positive achievement. Students who feel more competent about themselves and their ability to learn will be more likely to stay in school through high school and to pursue further education. On the other hand, low self-esteem, learned helplessness, and lack of consideration regarding personal functional strengths and weaknesses all predict poor educational outcomes and may be related to the length of academic and emotional struggles that come with academic failure (Brinckerhoff, 1996; Cummings et al., 2000). Early service provision may lead to higher short-term achievement, which may lead to higher self-competence, self-concept, and other personality variables that are known to predict post-high school success. It is expected that earlier service provision will be associated with likelihood of completing high school and with pursuing further education in the form of post-secondary education.

Method

Study Overview

This study will use data from the National Longitudinal Transition Study-2 (NLTS-2), a study of a nationally representative sample of youth with disabilities. The NLTS-2 is designed to document the experiences of students with disabilities as they move from school into adult roles and thus allows a rare opportunity to study long-term outcomes of students with learning disabilities. Sponsored by the National Center for Special Education Research (NCSER) at the Institute for Education Sciences (IES), United States Department of Education, the NLTS-2 followed a national sample of 12,000 students who were 13 to 16 years of age in 2000 over a 10-year period. The NLTS-2 focused on a wide range of topics, including high school coursework, extracurricular activities, academic performance, post-secondary education and training, independent living, and community participation. The breadth of the sample, depth of the information collected by the NLTS-2, and longitudinal nature of the study provide a rare opportunity to study real-life outcomes for students with disabilities.

Information for the NLTS-2 was collected from parents, youth, and schools in order to provide a national picture of the experiences of youth with disabilities as they transition into adulthood. Sources of information included interviews with parents or guardians, interviews with youth, teacher surveys, school program surveys, school characteristics surveys, student assessments, and student transcripts.

Participants

Description of the NLTS-2 Sample. The NLTS-2 used a two-stage sampling process to generate a nationally representative sample of students between 13 and 16 years of age receiving special education. A random sample of students receiving special education was sampled from a nationally representative sample of local education agencies (LEAs) and state-supported special schools. Thus LEAs are the primary sampling unit and students are the secondary, and final, sampling unit. Statistical power analyses conducted by the NLTS-2 Technical Work Group suggested a target sample size of

approximately 11,500 students, to include 1,250 students in each disability category, with an exception for fewer students from the three least populous categories (autism, traumatic brain injury, and deaf-blind). The sampling design of the NLTS-2 attempted to account for the length of the data collection period and assumptions regarding attrition rate. Sixteen-year-olds were oversampled whenever possible in order to maximize the longitudinal results of this oldest cohort. The sampling design of the NLTS-2 attempted to account for the length of the data collection period and assumptions regarding attrition rate and thus aimed for an initial sample of 12,943 students with disabilities (SRI International, 2000b). The sampling framework was designed so that data from the study would represent youth with disabilities nationally as a group, youth in each of the 12 federal special education disability categories (including learning disabilities), and youth in each of the single-year age groups in the study (NLTS-2 Data Brief, 2002).

The universe of LEAs, the primary sampling unit from which a random sample was drawn, was defined as operating LEAs in the 50 US states and Puerto Rico serving 10 or more students in grades 7 through 12 for which stratification variables of district wealth were available. This resulted in a master list of 12,435 LEAs and state-supported special schools expected to serve at least one student with a disability. This universe was stratified based on region of the country (northeast, southeast, central, west/southwest), district size/student enrollment (small, medium, large, very large), and district/community wealth (very low, low, medium, high). Appropriate LEAs were selected from within each stratum, which yielded a total sample of 2,205 LEAs. Because LEAs had an unequal probability of being selected into the stratum-based sample, LEAS were weighted by the inverse of the stratum sampling fraction to create population estimates. The LEAs selected into the sampling frame were contacted in the spring of 2000 to obtain their permission to participate in the NLTS-2 (SRI International, 2000b). More than 500 LEAs and state-supported special schools throughout the United States participated (NLTS-2 Data Brief, 2002).

In the fall of the 2000-01 school year, rosters of students between 13 and 16 years old receiving special education, plus their disability category and birth date, were requested from each participating LEA. The resulting roster was stratified by primary disability category as reported by the district. Students were randomly sampled from each disability category. After estimating the number of students receiving special education at the appropriate grade levels, sampling fractions were calculated to determine the appropriate number of students within each disability category at each age required from each LEA so that findings would generalize to individual categories after accounting for attrition and response rates. These sampling fractions served to maximize the effective sample efficiency while obtaining the required absolute sample sizes. Student sampling weights were calculated as the product of the LEA sampling weights and the inverse of the student sampling fraction. This final sampling weight is equal to the number of students in the universe of students with disabilities represented by an individual student in the sample (SRI International, 2000b). A total of 11,276 students were eligible and selected to participate in the NLTS-2.

Once a student was identified as a participant in the study, a questionnaire was sent to his or her parent that included information that would facilitate tracking of parents or guardians in order to minimize sample attrition (SRI International, 2000b). Over the next 10 years, information about schooling, community involvement, extracurricular activities, academic performance, and post-secondary education or training was collected from parents, youth, teachers, and school staff (SRI International, 2000a).

Study Sample. The data used for the current study will include all students in the NLTS-2 dataset with a documented specific learning disability for whom information is available post-high school. The final sample size for this study cannot be calculated without access to the restricted-use data available from the NLTS-2. However, an approximate sample size can be estimated from data about the probability of youth with specific learning disabilities within the NLTS-2 sample. Approximately 62% of

students receiving special education in the NLTS-2 sample were classified as having a learning disability. Because the NLTS-2 collected data from more than 11,000 students with disabilities, this means that approximately 6,820 students in the sample were classified as having a learning disability (NLTS-2 Data Brief, 2003). It is likely that post-high school information is not available for a portion of these students, which means the final sample size may be somewhat lower.

Instrumentation and variables

The data collection procedures developed by the NLTS-2 and used to assess key variables for this study will include parent interviews, interviews with youth, student assessments, and student transcripts. Individual variables were defined and assessed as follows.

Age when first received services for disabilities/conditions. The age at which each youth first received services due to a diagnosed specific learning disability was reported by the parent or guardian in the first phase of data collection. This variable includes receiving services from any professional (including Head Start, special education, private interventions, non-school special services, etc.) and was collected based on parents' responses to the following question: "About how old was [YOUTH] when [he/she] started getting special services from a professional for this difficulty?" This information will be included as an independent variable in these analyses to assess whether age of first service provision predicts long-term educational outcomes.

Age of identification of learning disability. The age at which youth were first diagnosed with a physical, learning, or other disability or problem was reported by the youths' parents in the first phase of data collection. Age of identification of disability is defined as a parent's response to the following question: "Thinking about the first or earliest disability, problem, or condition, about how old was [YOUTH] when [he/she] started having this difficulty or condition?" If needed, the following follow-up question was asked: "If it's easier to remember [YOUTH]'s grade level at that time, please give me that

information." This information will be examined to determine the relation between age of identification and age of intervention or first service provision.

Ability. Academic performance can be thought of as both a result of earlier education and an important predictor of post-school achievement. Because of this, direct assessments of initial ability or academic performance will be considered in the analyses.

Timing and description of ability assessments. Direct assessments of student ability were first conducted by a trained on-site professional other than the student's teacher in the second year of the study, which was the earliest year that such direct assessments were logistically feasible. The NLTS-2 Technical Work group recommended that all assessments be conducted with youths ages 16 to 18 in order to minimize age variation. Thus, those youth who were between 16 and 18 years old in Year 2 (2001-02) were assessed in spring 2002, and all other students were assessed in spring 2004 (Year 4; 2003-04), when they were 16 and 17 years of age (SRI International, 2000d).

All possible efforts to conduct assessments with all students in the sample, including those who had dropped out or graduated by the time of assessment, were made. Assessments were expected to take an average of 45 minutes, although students who required significant accommodations or modifications during the assessment process were given more time to complete the assessment (SRI International, 2000c). Because of the assumptions and recommendations made by the NLTS-2 Technical Work Group, there is no ideal measure of initial ability. However, these direct assessments of ability of participants between the ages of 16 and 18 serve as the best available estimate of initial ability.

Ability assessments were conducted using subtests of the Woodcock Johnson-Research Edition (WJR3). The Woodcock-Johnson tests of ability are a widely used measure with a proven track record in special education for cognitive testing. It is considered to be well-designed in terms of its psychometric properties and norming sample, which ranges from 2-90 years old (McGrew & Woodcock, 2001; SRI International, 2000d). The subtests selected reflect the NLTS-2 emphasis on core academic skills (SRI

International, 2000d). Actual reliability and validity estimates of the WJR3 were not calculated, but the reliability and validity estimates are assumed to be similar to those of the published Woodcock Johnson-Third Edition (WJIII). According to K. McGrew, the published version of the subtests had average reliability estimates of .85. The Research Edition was designed to be shorter and had average reliability estimates of .65 (personal communication, June 7, 2010). Reliability and validity statistics provided here for the subtests used are from the published versions of these tests.

Specific assessment measures: Reading achievement. Reading ability was measured using the *Letter-Word Identification* and the *Passage Comprehension* subtests of the WJR3. In *Letter-Word Identification*, the student is asked to identify isolated letters and words orally; it is not necessary that the student know the meaning of the words. This subtest is considered to be a measure of reading decoding. According to the WJIII Technical Manual for the standardization sample, Letter-Word Identification showed split-half reliability estimates ranging from .88 to .91 for ages 16-18. There is evidence of validity; for example, intercorrelations between Letter-Word Identification and other test scores measuring verbal abilities ranged from .69 to .72 for the standardization sample aged 14-19 (McGrew & Woodcock, 2001).

In *Passage Comprehension*, the student is asked to read a short passage silently, comprehend the information, and provide a missing word. This subtest is considered to measure reading comprehension and lexical knowledge (SRI International, 2000d). The WJIII Technical Manual for the standardization sample reports that Passage Comprehension showed split-half reliability estimates ranging from .73 to .78 for ages 16-18. Again, there is evidence of validity; for example intercorrelations between Passage Comprehension and other test scores measuring verbal abilities ranged from .61 to .68 for the standardization sample aged 14-19 (McGrew & Woodcock, 2001).

Specific assessment measures: Math achievement. Math ability was measured using the *Applied Problems* and the *Calculation* subtests of the WJR3. In *Applied Problems*, the student is asked to

analyze and solve practical math problems. This subtest is considered to measure quantitative reasoning, math ability, and math knowledge, as the student must decide the appropriate mathematical operations to use and which data to include in the calculation. According to the WJIII Technical Manual for the standardization sample, Applied Problems showed split-half reliability estimates ranging from .92 to .93 for ages 16-18. Validity evidence included intercorrelations between Applied Problems and other measures of math ability ranging from .51 to .79 for the standardization sample aged 14-19 (McGrew & Woodcock, 2001).

In *Calculation*, the student is asked to perform a variety of mathematical calculations ranging from simple addition to calculus. This subtest is designed to measure a student's ability to perform mathematical computations that are fundamental to complex math reasoning and problem solving, but does not actually require reasoning or problem solving skills (SRI International, 2000d). The WJIII Technical Manual for the standardization sample reports that Calculation showed split-half reliability estimates ranging from .82 to .85 for ages 16-18. There is evidence of validity; for example, intercorrelations between Calculation and other measures of math ability range from .50 to .71 for the standardization sample aged 14-19 (McGrew & Woodcock, 2001).

Child demographic characteristics. Information about the youth's gender, race, and socioeconomic status (household income and parental education), were all collected as a part of the initial parent interview.

***Gender*.** Differences in the achievements of men and women both in school and in the workplace have been noted in the general population (NCES, 2002). It has also been noted that gender is intertwined with the nature of disabilities, with males and females being unequally represented within disability categories. Including gender in the analyses will enable the effects of the independent variables to be understood independent of the effect of gender. Thus, gender will be controlled for in the models.

Racial/ethnic background. The relative disadvantage of racial minority youth in education and employment has been documented extensively (NCES, 2002). Like gender, racial/ethnic categories are unequally distributed across the disability categories. Analyses will control for racial/ethnic background in order to assess the relationships between the variables independent of race or ethnicity.

Race/ethnicity is defined by the response of the youths' parent to the following two questions: (1) "Is [YOUTH] of Hispanic, Latino, or other Spanish origin?" and (2) "Please choose one or more categories that best describe [YOUTH]. Is he/she: White; African-American; American Indian or Alaskan Native; Asian; Native Hawaiian or Other Pacific Islander; or other?" Multiple races could be recorded.

The first question will be included in the analyses as a dichotomous variable, where individuals are coded as Hispanic/Latino/Spanish origin or other. The second variable is somewhat more problematic, as respondents were allowed to record multiple races and thus the categories are not mutually exclusive. In this study, individuals who recorded multiple races will be excluded from the analyses. This allows race to be controlled for in a way that can be analyzed appropriately. Because research on learning disabilities has focused on racial minority youth as a category, the race/ethnic variable will be coded as White or other.

Household income. Poverty has been shown to have serious negative consequences for children and youth as a whole, but this may be magnified for students with disabilities. Approximately 25% of youth with disabilities live in poverty, which is a higher rate than the general population (Marder, Levine, Wagner, & Cardoso, 2003). Including household income in the analyses will help disentangle any interrelations that exist between poverty, racial/ethnic background, and disability. As with gender and race/ethnicity, controlling for household income will help reveal the unique effects of age of intervention on the dependent variables.

Household income was assessed in the first phase of data collection. It is measured by the youth's parent's response to the following questions:

> In studies like these, households are sometimes grouped according to income. Please tell me which group best describes the total income of all persons in your household in the last tax year, including salaries or other earnings, money from public assistance, retirement, and so on, for all household members, before taxes. Was your household income in the past year…$25,000 or less or more than $25,000?

If respondents answered the first option ($25,000 or less), they were further probed regarding whether it was $5,000 or less; $5,001 to $10,000; $10,001 to $15,000; $15,001 to $20,000; or $20,001 to $25,000. If respondents answered the second option (more than $25,000), they were further asked: "Was it…$50,000 or less or more than $50,000?" Each of these answer options prompted a further question with the following categories: $25,001 to $30,000; $30,001 to $35,000; $35,001 to $40,000; $40,001 to $45,000; or $45,001 to $50,000 (for respondents who answered $50,000 or less) or $50,001 to $55,000; $55,001 to $60,000; $60,001 to $65,000; $65,001 to $70,000; $70,001 to $75,000; or over $75,000 (for respondents who answered more than $50,000). In this study, household income will be coded as a continuous variable, with each income range category represented by a successive number (e.g., 1 = $5,000 or less, 2= $5,001 to $10,000, 3 = $10,001 to $15,000, etc.)

Parental education. The highest level of education completed by the youth's parents or guardians will be considered in the analyses. Along with household income, parental education is considered to be a valid proxy for socioeconomic status (Vogt, 2005). The model used in these analyses will control for parental education in order to further reveal the unique effects of age of first service provision on the dependent variables.

Parental education level was assessed in the first phase of data collection. It is measured by the youth's parent's responses to the following questions: (1) "What is the highest year or grade you finished in school?" and (2) "What is the highest year or grade your spouse/partner finished in school?" Response options were: 8th grade or less; 9th grade or above, not a high school graduate; high school graduate or GED; post high school education, no college degree; vocational-technical (voc-tech) degree or certificate; 2-year college degree/AA degree; 4-year college degree/BA, BS degree; some post BA, BS

work, no degree; master's degree, e.g., MSW, MA, MFA, MPH, MBA; PHD, MD, JD, LLB, or other professional graduate degree; or other. Consistent with NLTS-2 reports, these data will be collapsed and coded into the following categories: less than a high school degree; high school graduate or GED; post high school education, no college or vocational-technical degree; 2-year college degree/AA degree; 4-year college degree/BA, BS degree; and post-graduate work or degree.

Transition services. Research on post-secondary outcomes for youth with disabilities has found that whether or not youth participate in transition services may be an important factor (Cummings et al., 2000). Thus, whether youth in this study participated in transition services will be controlled for in these analyses. Transition services is measured by the youth's parent's response to the following question: "Did YOUTH meet with teachers to set goals for what [he/she] will do after high school and make a plan for how [he/she] will achieve them?" Controlling for youth participation in transition services in these analyses will help reveal the unique effects of age of first service provision on the dependent variables.

Educational achievement. Educational achievement refers to student performance on academic measures. High school transcripts will be used to investigate how students receiving special education are faring. Student transcript information from Year 8 (2007-08) or the latest transcript available will be used as the final measure of educational achievement in high school. The youngest cohort was 21 in Year 8 of the study, which is the latest year a student is covered under IDEA. Therefore all students, including the youngest cohort, should have transitioned out of high school by Year 8.

Educational achievement is measured by students' grades on their high school transcript. Student's grades will be calculated into a standardized form of a Grade Point Average (GPA) and will be included in these analyses as a continuous variable.

Educational attainment. Educational attainment refers to the highest degree of education an individual has completed or the number of years of schooling an individual has completed. In this study,

three measures of educational attainment will be used to investigate the extent to which students with learning disabilities are completing high school and pursuing further educational opportunities, as well as the intensity with which they are pursuing post-secondary education.

School completion status. Each student's high school completion status, including whether the student graduated with a diploma, graduated with a certificate, aged out, or dropped out, will be used as a measure of educational attainment. This information was collected for all students from school records. This variable will be re-coded as a dichotomous variable to examine whether students are completing high school (with a diploma or a certificate) versus whether they are not (aged out or dropped out).

Pursuing post-secondary education. The extent to which students go on to pursue post-secondary education when they leave high school was investigated by the NLTS-2. This included what kinds of educational institution students attend (e.g., community college, vocational school, 4-year institution), the nature of training (e.g., field of study in college, self-development courses, vocational skills training), the intensity with which they pursue post-secondary education (e.g., hours enrolled, credits attained), and the pattern of enrollment (e.g., age beginning, consistency of enrollment, years of attendance). This information was collected from interviews with the youth in the latter years of the study.

One of the primary questions being investigated in this study is whether age of first service provision predicts whether students pursue post-secondary education. Thus, this question will be analyzed through a dichotomous dependent variable wherein students are categorized as enrolling or not enrolling in a post-secondary institution, regardless of institution type.

Intensity of pursuing post-secondary education. For those students who do enroll in post-secondary education, three other variables will be examined to investigate the intensity with which students are pursuing post-secondary education and how students are faring in post-secondary

education. These variables are number of hours enrolled, number of credits obtained, and the arithmetic difference between the two. Number of hours enrolled and number of credits obtained each provides information about the intensity with which students are pursuing post-secondary education. The difference between these variables provides information about how well students are doing academically in their post-secondary educational institutions. These three variables will be examined as continuous dependent variables to investigate how intensely those students who do enter post-secondary education are pursuing their education.

Analyses and Expected Results

Preliminary Analyses

Prior to conducting multiple regression analyses of the data, preliminary analyses will be conducted to ensure that no assumptions of multiple regression have been violated. Descriptive statistics, including frequencies, means and standard deviations, ranges, and minimums and maximum values, of each of the variables will be calculated and analyzed. Scatterplots of the data, including plots of the residuals against the independent variables, will be checked both for linearity and for homoscedasticity. A Q-Q plot of the residuals will be examined to check for normality of the residuals. Additionally, analyses of Cook's distance, leverage, and influence will determine that errors and outliers are in line with the assumptions of multiple regression. Within each analysis, an examination of variance inflation factor (VIF) will determine any problems with multicollinearity.

The complex stratified cluster sampling design used for the NLTS-2 raises some concerns. The NLTS-2 used a two-stage sampling process to generate a nationally representative sample. Students, the secondary level of stratification, are nested within LEAs, the primary level of stratification. This design may result in biased parameter estimates and could cause a violation of the independence assumption within multiple regression, leading to less precise estimates of regression coefficients and an underestimation of standard errors (Stapleton & Thomas, 2008). The student sampling weight provided by the NLTS-2, which is equal to the number of students in the universe represented by an individual student in the sample, will be used to account for the over-sampling and non-response rates within the sample and to provide less biased parameter estimates.

A power analysis was conducted using G-Power software, version 3.1, to determine sample size needed to obtain a statistically significant finding in the proposed study, given certain parameters of power and effect size (Faul, Erdfelder, Buchner, & Lang, 2009). With the parameters of power equal to .80, a relatively small effect size of .02 (Faul et al., 2009), alpha level of .05, and 18 predictors (the

maximum number of predictors that will be used in any of the regression analyses for this study), a total sample size of 1,022 is needed. There are approximately 6,820 students with learning disabilities in the NLTS-2 sample; though post-high school information will not be available for all of these participants, the number of individuals in the sample for this study will be considerably greater than 1,022. Thus, this study will demonstrate power of greater than 80%, the level considered adequate in most research studies.

Tests of Research Questions

The regression analysis procedures as well as effect size guidelines described by Keith (2006) will be used to conduct the multiple regression analyses and analyze the data. An alpha level of .05 will be used throughout the analyses.

Hypothesis 1. It is hypothesized that the age a student is identified as having a learning disability and the age he or she receives services will be strongly and positively correlated. It is similarly hypothesized that the average difference between these two constructs will be small. Pearson correlations will be calculated to determine the relation between the age a parent reported their child first received a diagnosis of having a learning disability and the age a parent reported their child first received services from a professional for this disability. The average difference between these two variables will also be calculated. It is expected that the Pearson correlation coefficient will be strong and positive and that the average difference between the two variables will be small.

Hypothesis 2. It is hypothesized that early service provision for learning disabilities will predict higher educational achievement, as measured by high school transcript, after controlling for demographic variables, ability, and participation in transition services.

Using multiple regression, educational achievement, as measured by high school GPA calculated from students' high school transcripts, will be regressed on gender, race, household income, parental education, initial ability, participation in transition services, and the age at which youth first received

services for a learning disability. It is expected that age of receiving first services will explain a significant amount of variability in educational achievement. In other words, receiving special education services for a learning disability at an earlier age will predict higher achievement, as measured by grades on students' high school transcripts.

Hypothesis 3. It is also hypothesized that early service provision for learning disabilities will predict students' educational attainment, after controlling for demographic variables, ability, and participation in transition services. Similar to the previous model, educational attainment, as measured by the dichotomous variable of high school completion status, will be regressed on gender, race, household income, parental education, initial ability, participation in transition services, and age at which youth first received services for a learning disability using logistic regression. It is expected that age of first receiving services for a learning disability will explain a significant amount of variability in high school completion status. In other words, receiving special education services for a learning disability at an earlier age will predict a greater likelihood of graduating from high school with a diploma or a certificate.

For those students in the sample who do complete high school, a second regression will be run to further investigate this question of the effect of age of service provision on educational attainment. Whether or not students who graduate from high school pursue post-secondary education will be regressed on gender, race, household income, parental education, initial ability, participation in transition services, and age at which youth first received services for a learning disability using logistic regression. Because the question of interest is whether age of first service provision predicts the extent to which students with learning disabilities enroll in post-secondary education institutions, pursuing post-secondary education will be measured by a dichotomous variable indicating whether or not students enroll in post-secondary educational institutions, regardless of institution type. It is expected that age of first receiving services for a learning disability will explain a significant amount of variability

in pursuing post-secondary education. In other words for those students who do complete high school, receiving special education services for a learning disability at an earlier age will predict a greater likelihood of enrolling in a post-secondary institution.

For those students who do enroll in post-secondary education, further analyses will investigate whether age of first service provision predicts the intensity with which they are pursuing their education and how well they are faring. This will include three variables: hours enrolled; credits obtained; and the arithmetic difference between the two. Three multiple regression analyses will be run. In the first, hours enrolled will be regressed on gender, race, household income, parental education, initial ability, participation in transition services, and age at which youth first received services for a learning disability. In the second analysis, credits obtained will be regressed on these same variables. Each of these analyses will further elucidate the relation between age of first service provision and students' educational attainment. It is hypothesized that receiving special education services for a learning disability at an early age will predict a greater intensity of pursuing post-secondary education, as measured by number of hours enrolled and number of credits obtained.

Lastly, the arithmetic difference between the number of hours in which a student has enrolled and the number of credits that student has obtained will be regressed on these same variables of gender, race, household income, parental education, initial ability, participation in transition services, and age at which youth first received services for a learning disability. It is expected that receiving special education services for a learning disability at an earlier age will be associated with a greater likelihood of success in post-secondary education, as measured by a smaller difference between the number of credits enrolled and the number of hours obtained.

Discussion

Summary

The proposed study seeks to further understand the relationship between age of identification of learning disabilities, age at which youth first receive services for disabilities, and long-term educational outcomes, including educational achievement and educational attainment. It is expected that receiving services earlier in life will predict more positive educational outcomes, including academic achievement in high school, high school completion, enrolling in post-secondary education, and success in pursuing post-secondary education. Because no study to date has examined this relation, this study will contribute to the field of learning disability interventions by examining the long-term effects of age of first service provision and age of identification.

Previous research has investigated the long term effects of education in general and specifically for children in poverty. This research has largely concluded that early education has widespread beneficial effects for students in general and for students living in poverty, specifically. There also has been a push in the special education field within the last few decades to identify children with or at-risk for learning disabilities as early as possible, in hopes that early intervention will subsequently reduce or eliminate the effect of a child's disability or delay and allow them to succeed academically. However, studies investigating early intervention for students at-risk for learning disabilities rarely have examined the effects of such interventions past one or two years.

Students with learning disabilities now make up over half of the students receiving special education and approximately 5% of all students in the United States (Fletcher et al., 2007; Lyon et al., 2001). Without intervention, it has been found that students who struggle academically are likely to continue to struggle for the remainder of their academic careers, and that these struggles impact non-academic transitions to adulthood. Academic struggles include the Matthew effects of reading, where the gap between good and poor readers continues to grow as good readers gain reading skill,

proficiency and vocabulary because they read more while poor readers do not read and therefore remain stagnant in their reading skill (Stanovich, 1986). Studies have found that regardless of interventions, students continue to struggle throughout their academic career and, indeed, throughout their whole lives (Lyon, 1996; Sitlington, 2008).

Just as research on the effects of early education benefited greatly from long-term studies, so too will the field of early intervention for students with learning disabilities. This study seeks to investigate the relationship between learning disability identification, intervention, and adult or long-term outcomes in order to further understand what interventions should look like and when they should be implemented to be most effective in ameliorating the difficulties that accompany learning disabilities.

Limitations

The non-experimental nature of this study can be thought of as both its biggest weakness and its biggest strength. The data available from the NLTS-2 do not provide information on what methods were used to identify learning disabilities or what types of services were provided for students with learning disabilities; variables regarding service provision were simply collected based on parent report of youth's age when first diagnosed and youth's age when services for the disability were first provided. Both identification and intervention practices differ widely between LEAs, school districts, and individual schools. Such differences in identification and intervention practices are likely to have a great effect on students identified as learning disabled, including whether they are identified as such, when they are identified, and what services are provided for them. Thus, the lack of control over these practices and the absence of data about these practices mean that results from this study can only be analyzed in very general terms. The gross nature of this study limits its usefulness in informing decisions about specific special education programs, whether related to methods of identification or types of intervention

services. The specifics of each school's identification guidelines and intervention services will still need to be considered in making decisions about what services to provide and when.

However on a related level, this limitation can also be considered a strength. The real-world nature of these data allows for a true examination and analysis of how students with learning disabilities are functioning in America today. These data provide a real-world, up-to-date, national picture of how age of identification is currently impacting long-term educational outcomes. The representativeness of these data, in terms of gender, race, and SES is also a strength of this study relative to other studies carried out in a more tightly-controlled and smaller way.

Another limitation of these data is the retrospective nature of two of the key independent variables. Age of identification and age of first service provision were both collected from parent interviews. Parents were asked to remember and report what age their child was when he or she first experienced difficulties related to a learning disability and at what age he or she first received services from a professional addressing these difficulties. Human memory is inherently flawed, and parents may not be able to accurately remember when their child was first diagnosed or when he or she first received services. The possibility of parents misremembering and therefore misreporting these variables may be a threat to internal validity.

One other type of information that is limited in this study is initial ability. A strong measure of initial ability is absent from the NLTS-2 dataset. The assessments of reading and math ability are statistically reliable and valid; however they were not collected until the youth in the study were aged 16-18. Thus, it is hard to consider this information to be a good measure of initial ability. The later in life ability is assessed, the more related it is to the dependent variables of this study, which decreases the chances of finding significant effects. However, initial ability is an important variable to control for when considering long-term outcomes. Given the relation between ability and long-term educational outcomes, an earlier measure of ability might help provide important information about the relationship

between the independent and dependent variables. The lack of such a measure is a limitation of these data.

Another limitation of these data is the ceiling effect created by the age limitations of the study. To be a part of the study sample, youth had to have a diagnosed disability at 13-16 years old when data collection began. Youth who are diagnosed after this age, or older than 16, would not have been eligible to participate in this study. This study seeks to investigate the long-term outcomes of age of service provision. However due to the nature of the data, no information about long-term outcomes of youth diagnosed after the age of 16 can be inferred. A strength of this study is that information about interventions before school age was collected; thus, information about students identified early can be inferred. However, findings from this study only represent students diagnosed with a learning disability prior to age 16. Future studies will need to examine data for students identified beyond age 16 to investigate whether those students face similar long-term educational outcomes.

Within the realm of internal validity, this study has a few methodological flaws. The most significant flaw is the choice of statistical analysis. While multiple regression provides a satisfactory means of investigating whether age of service provision predicts long-term educational outcomes, the nature of the data makes multiple regression problematic. These data were sampled on two levels; LEAs were the primary sampling unit and students were the secondary and final sampling unit. The nested nature of these data indicates that hierarchical linear modeling (HLM) would better be able to investigate the research questions. Unfortunately though HLM analyses seem preferable, their use is beyond the scope of the investigator's current knowledge of statistics.

With regards to external validity, a strength of these data is the breadth and diversity of the sample. However, attrition rates must be examined to further understand whether data available about the outcome variables remain nationally representative. An additional threat to external validity has to do with the timing of the data collection. Though the end of data collection was extremely recent

(2009), this study captures the educational experiences of students identified as learning disabled during the 1990s. To be included in the sample, students had to have been diagnosed with a disability by 2000, the year data collection began. Since that time, both NCLB and IDEA have been re-authorized, and different assessment methods (e.g., RTI and movement away from discrepancy methods) are now allowed for and have gained favor across many educational systems. This means that changes in identification and intervention practices may have occurred between when the sample was diagnosed and first received services and when this study will be carried out. Therefore, the results of this study may be less generalizable to students and schools today than would be ideal.

Implications

Accumulated research evidence about learning disabilities has led to a consensus that the "wait and see" approach to identifying learning disabilities is no longer acceptable. Because of this, many researchers have been pushing for the early identification of learning disabilities. However, very little is known about the long-term outcomes of early identification of learning disabilities. Does early identification help students educationally long-term? This study will contribute to the field of the long-term effects of education and to the field of special education interventions by delivering information about longitudinal effects of age of special education service provision.

When early educational programming was first implemented on a wide scale basis in the 1960s and 1970s, researchers were eager to determine whether these programs produced long-term benefits. Longitudinal studies conducted through the 1980s and beyond confirmed that participation in early childhood programming was associated with multiple benefits for children in poverty, including benefits that persisted into adulthood (Barnett, 1995; Barnett, 1998; Garces et al., 2000). Woodhead (1985) posited that these positive effects are due to a transactional model wherein initial beneficial effects for children in preschool interact with later life experiences and expectations to produce long-term changes. Though there has been a push in recent decades to intervene early with children at-risk for

learning disabilities, no longitudinal studies have been conducted to confirm whether a similar transactional model applies to students with learning disabilities.

Are there long-term benefits of providing special education services earlier? Can students benefit from early intervention rather than the "wait-to-fail" approach inherent in using discrepancy methods? If educational achievement and educational attainment are significantly and positively related to age of first service provision, it would support the notion that early intervention is needed and beneficial. This finding could stimulate the development of appropriate assessment methods and special education services for young children. On the other hand, if no significant association is found, it could mean the field of special education should focus on developing and providing appropriate services at all ages, rather than focusing on early intervention services. Regardless of direction, this study will inform assessment and intervention practices, as well as transition planning, by advancing knowledge about the long-term effects of timing of service provision on students with learning disabilities.

Works Cited

American Youth Policy Forum (AYPF) and Center on Education Policy (CEP) (2001). Twenty-five years of educating children with disabilities: The good news and the work ahead. Washington DC: Author. Available at: http://www.aypf.org/publications/special_ed.pdf.

American Psychiatric Association (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., text revision) (*DSM-IV-TR)*. Washington, DC: Author.

Barnett, W. S. (1992). Benefits of compensatory preschool education. *The Journal of Human Resources, 27*(2), 279-312.

Barnett, W. S. (1995). Long-term effects of early childhood programs on cognitive and school outcomes. *The Future of Children, 5*(3), 25-50.

Barnett, W. S. (1998). Long-term cognitive and academic effects of early childhood education on children in poverty. *Preventive Medicine, 27*, 204-207.

Berninger, V. W. & Abbott, R. D. (1994). Redefining learning disabilities: Moving beyond aptitude achievement discrepancies to failure to respond to validated treatment protocols. In G.R. Lyon (Ed.), *Frames of reference for the assessment of learning disabilities: New views on measurement issues* (pp. 163-183). Baltimore, MD: Paul H. Brookes.

Blachman, B.A., Ball, E., Black, R., and Tangel, D. (1994). Kindergarten teachers develop phoneme awareness in low-income inner-city classrooms: Does it make a difference? *Reading and Writing: An Interdisciplinary Journal, 6*, 1-17.

Blackorby, J., Schiller, E., Mallik, S., Hebbeler, K., Huang, T., Javitz, H., et al. (2010). *Patterns in the Identification of and Outcomes for Children and Youth with Disabilities: Executive Summary* (NCEE 2010-4006). Washington, DC: National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education.

Blalock, G. & Patton, R. (1996). Transition and students with learning disabilities: Creating sound futures. *Journal of learning disabilities, 29*(1), 7-16.

Brinckerhoff, L. (1996). Making the transition to higher education: Opportunities for student empowerment. *Journal of learning disabilities, 29*(2), 118-136.

Brofenbrenner, U. (1974). Is early intervention effective? *Early Childhood Educational Journal, 2*(2), 14-18.

Cameto, R., Levine, P., & Wagner, M. (2004) *Transition planning for students with disabilities: A special topic report from the National Longitudinal Transition Study-2 (NLTS-2).* Menlo Park, CA: SRI International. Available at: www.nlts2.org/reports/2004_11/nlts2_report_2004_11_complete.pdf.

Cavanaugh, C. L., Kim, A., Wanzek, J., & Vaughn, S. (2004). Kindergarten reading interventions for at-risk students: Twenty years of research. *Learning Disabilities: A Contemporary Journal, 2*(1), 9-21.

Cummings, R., Maddux, C. D., & Casey, J. (2000). Individualized transition planning for students with learning disabilities. *Career Development Quarterly, 49,* 60-72.

Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods, 41*, 1149-1160.

Fletcher, J. M. & Vaughn, S. (2009). Response to intervention: Preventing and remediating academic difficulties. *Child Development Perspectives, 3*(1), 30-37.

Fletcher, J. M., Lyon, G. R., Fuchs, L. S., & Barnes, M. A. (2007). *Learning Disabilities: From Identification to Intervention*. New York, NY: The Guilford Press.

FPG Child Development Center (1999). Early learning, later success: The Abecedarian study. Chapel Hill, NC: Author. Retrieved August 2010 from http://www.fpg.unc.edu/~abc/ells-04.pdf.

Garces, E. Thomas, D., & Currie, J. (2000). Longer term effects of Head Start. (Report No. DRU-2439-NICHD/NSF.) RAND Corporation.

Gerber, P. J. & Price, L. A. (2003). Persons with learning disabilities in the workplace: What we know so far about the American with Disabilities Act era. *Learning Disabilities Research and Practice, 18*(2), 132-136.

Good, R. H., Simmons, D. C., & Smith, S. B. (1998). Effective academic interventions in the United States: Evaluating and enhancing the acquisition of early reading skills. *Education and Child Psychology, 15*(1), 56-70.

Gresham, F. I. (2002). *Responsiveness to intervention: An alternative approach to the identification of learning disabilities*. Washington, DC: Paper presented at the Learning Disabilities Summit: Building a Foundation for the Future. (ERIC Document Reproduction Service No. ED458755).

Hanushek, E. A., Kain, J. F., & Rivkin, S. G. (1998). Does special education raise academic achievement for students with disabilities? National Bureau of Economic Research (NBER) Working Paper No. 6469_1998.

Hudson, B. (2003). From adolescence to young adulthood: The partnership challenge for learning disability services in England. *Disability and Society, 18*(3), 259-276.

Individuals with Disabilities Education Improvement Act of 2004, 20 U.S.C. § 1400 et seq. (2004).

Janus, A. L. (2009). Disability and the transition to adulthood. *Social Forces, 88*(1), 99-120.

Jenkins, J. R. & O'Connor, R. E. (2002). Early identification and intervention for young children with reading/learning disabilities. In R. Bardley, L. Danielson, & D. Hallahan (Eds.), *Identification of learning disabilities: Research to practice* (pp. 99-151). Malwah, NJ: Erlbaum.

Jensen, A. R. (1969). How much can we boost IQ and scholastic achievement? *Harvard Educational Review, 39*(1), 1-123.

Juel, C. (1988). Learning to read and write: A longitudinal study of 54 children from first through fourth grades. *Journal of Educational Psychology, 80*(4), 437-447.

Kavale, K. A. & Forness, S. R. (2000). What definitions of learning disability say and don't say: A critical analysis. *Journal of Learning Disabilities, 33*(3), 239-256.

Keith, T. Z. (2006). *Multiple Regression and Beyond*. Boston, MA: Pearson.

Kirk, S. (1962). *Educating Exceptional Children*. Boston, MA: Houghlin Mifflin.

Lazar, I., & Darlington, R. B. (1982). *Lasting effects of early education: A report from the consortium for longitudinal studies.* Monograph of the Society for Research in Child Development, No. 47, 2-3.

Lennon, J. E. & Slesinski, C. (1999). Early intervention in reading: Results of a screening and intervention program for kindergarten students. *School Psychology Review, 28*(3), 353-364.

Lerner, J. (1989) Educational interventions in learning disabilities. *Journal of the American Academy of Child and Adolescent Psychiatry, 28*, 326-331.

Lyon, G. R. (1996). Learning disabilities*. The Future of Children: Special Education for Students with Disabilities, 6*(1), 54-75.

Lyon, G. R., Fletcher, J. M., Shaywitz, S. E., Shaywitz, B. A., Torgesen, J. K., Wood, F. B., et al. (2001). Rethinking learning disabilities. In C.E. Finn, Jr., R. A. J. Rotherham & CF.R. Hokanson, Jr. (Eds.), *Rethinking special education for a new century* (pp. 259-287). Washington, DC: Thomas B. Fordham Foundation and Progressive Policy Institute.

Marder, C., Levine, P., Wagner, M., & Cardoso, D. (2003). Household characteristics of youth with disabilities. In M. Wagner, C. Marder, P. Levine, R. Cameto, T. W. Cadwallader, & J. Blackorby (with D. Cardoso & L. Newman). *The individual and household characteristics of youth with disabilities* (pp. 3:1-3:18). Menlo Park, CA: SRI International. Available at: http://www.nlts2.org/reports/components/component1.html

McGrew, K. S. & Woodcock, R. W. (2001). Technical Manual. *Woodcock-Johnson III*. Itasca, IL: Riverside Publishing.

National Center for Education Statistics (NCES). (1999). *Students with disabilities in postsecondary education: A profile of preparation, participation, and outcomes.* Washington, DC: U.S. Department of Education. Available at http://nces.ed.gov/pubs99/1999187.pdf.

National Center for Education Statistics (NCES). (2002). *Digest of education statistics, 2002*. Washington, DC: U.S. Department of Education. Available at http://nces.ed.gov/pubs2003/digest02/.

National Joint Committee on Learning Disabilities (NJCLD). (1994). Secondary to postsecondary education transition planning for students with learning disabilities. In *Collective Perspectives on Issues Affecting Learning Disabilities* (pp. 97-104).Austin, TX: PRO-ED.

National Joint Committee on Learning Disabilities (NJCLD). (1998). Operationalizing the NJCLD definition of learning disabilities for ongoing assessment in schools. *American Speech-Language-Hearing Association (ASHA), 40*(Suppl. 18).

National Reading Panel (2000). Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implications for reading instruction. *(NIH Pub. No. 00-4754). Washington, DC: National Institute of Child Health and Human Development.*

Newman, L., Wagner, M., Cameto, R. & Knokey, A. M. (2009) *The post-high school outcomes of youth with disabilities up to four years after high school* (pp. 1-12). Menlo Park, CA: SRI International. Available at: ww.nlts2.org/reports/2009_04/nlts2_report_2009_04_complete.pdf.

NLTS2 Data Brief: Introducing the NLTS2. A Report from the National Longitudinal Transition Study-2. (2002, January). Available at www.ncset.org/publications/viewdesc.asp?id=248.

NLTS2 Data Brief: Who Are Secondary Students in Special Education Today. A Report from the National Longitudinal Transition Study-2. (2003, June). Available at www.ncset.org/publications/viewdesc.asp?id=1008.

No Child Left Behind Act of 2001, 20 USC, §100 et seq. (2001).

Office of Economic Opportunities (1969). The impact of Head Start: An evaluation of Head Start on children's cognitive and affective development, pursuant to Contract B89-4536. (Report No. PB 184 328.) Westinghouse Learning Corporation for Federal Scientific and Technical Information, US Institute for Applied Technology. Washington, DC: Author. (ERIC Document Reproduction Service No. ED036321).

Office of Educational Research and Improvement (2004). Changing the way we identify learning disabilities. *CEC Today*. Retrieved May 2010 from http://www.cec.sped.org/AM/Template.cfm?Section=Identifying_Learning_Disabilities&Template=/TaggedPage/TaggedPageDisplay.cfm&TPLID=11&ContentID=3543. (ERIC Document Reproduction No. ED99CO0026).

Perez-Johnson, I. & Maynard, R. (2007). The case for early, targeted interventions to prevent academic failure. *Peabody Journal of Education, 82*(4), 587-616.

Reschly, D. J. (2005). Learning disabilities identification: Primary intervention, secondary intervention, and then what? *Journal of Learning Disabilities*, 38(6), 510-515.

Reynolds, A. J., Temple, J. A., Robertson, D. L., & Mann, E. A. (2001). Long-term effects of an early childhood intervention on educational achievement and juvenile arrest: A 15-year follow-up of low-income children in public schools. *Journal of American Medical Association, 285(*18), 2339-2346.

Reynolds, A. J., Temple, J. A., Robertson, D. L., & Mann, E. A. (2002). Age 21 cost-benefit analysis of the Title I Chicago Child Parent Centers. *Educational Evaluation and Policy Analysis, 24*(4), 267-303.

Reynolds, C. R. & Shaywitz, S. E. (2009). Response to intervention: Ready or Not? Or, from wait-to-fail to watch-them-fail. *School Psychology Quarterly, 24*(2), 130-145.

Schweinhart, L. J. (1994). Lasting benefits of preschool programs. ERIC Digest [Online]. Retrieved May 2010, from http://www.ericdigests.org/1994/lasting.htm. (ERIC Document Reproduction Services No. ED365478).

Shaywitz, S. E., Morris, R., & Shaywitz, B. A. (2008). The education of dyslexic children from childhood to young adulthood. *Annual Review of Psychology, 59*, 451-475.

Sitlington, P. L. (1998). Students with reading and writing challenges: Using informal assessment to assist in planning for the transition to adult life. *Reading and Writing Quarterly, 24,* 77-100.

Smith, G. & James, T. (1975). The effects of pre-school education: Some American and British evidence. *Oxford Review of Education, 1*(3), 223-240.

Snow, C. E., Burns, M. S., Griffin, P. (Eds.) (1998). Preventing reading difficulties in young children. Washington, DC: National Academy Press. Report by the National Reading Council.

SRI International (January, 2000a). *The National Longitudinal Transition Study-2 (NLTS-2) Conceptual Framework and Research Questions.* Menlo Park, CA: Author.

SRI International (January, 2000b). *The National Longitudinal Transition Study-2 (NLTS-2) Sampling Plan.* Menlo Park, CA: Author.

SRI International (January, 2000c). *The National Longitudinal Transition Study-2 (NLTS-2) Study Design, Timeline, and Data Collection Plan.* Menlo Park, CA: Author.

SRI International (May, 2000d). *The National Longitudinal Transition Study-2 (NLTS-2) Planned Direct Assessment Content and Process.* Menlo Park, CA: Author.

Stanovich, K. E. (1986). Matthew effects in reading: Some consequences of individual differences in the acquisition of literacy. *Reading Research Quarterly, 21*(4), 360-407.

Stapleton, L. M. & Thomas, S. L. (2008). The use of national datasets for teaching and research: Sources and issues. In A. A. O'Connell & D. B. McCoach (Eds.), *Multilevel modeling of educational data* (pp 11-57). United States: Information Age Publishing.

Torgesen, J. K. (2002). The prevention of reading difficulties. *Journal of School Psychology, 40*(1), 7-26.

Vaughn, S. & Fuchs, L. S. (2003). Redefining learning disabilities as inadequate response to instruction: The promise and potential problems. *Learning Disabilities Research and Practice, 18*(3), 137-146.

Vogt, W. P. (2005*). Dictionary of Statistics and Methodology: A Nontechnical Guide for the Social Sciences*, 3rd Edition. Thousand Oaks, CA: Sage.

Wagner, M., Marder, C., Blackorby, J., Cameto, R., Newman, L., Levine, P., et al. (2003). *The Achievements of Youth with Disabilities During Secondary School. A Report from the National Longitudinal Transition Study-2 (NLTS2).*Menlo Park, CA: SRI International. Available at www.nlts2.org/reports/2003_11/nlts2_report_2003_11_complete.pdf.

Wong, V. C, Cook, T. D., Barnett, W. S., & Jung, K. (2008). An effectiveness-based evaluation of five state pre-kindergarten programs. *Journal of Public Analysis and Management, 27*(1), 122-154.

Woodhead, M. (1985). Pre-school education has long-term effects: But can they be generalized? *Oxford Review of Education, 11*(2), 133-155.

Yell, M. L., Rogers, D., & Lodge Rodgers, E. (1998). The legal history of special education: What a long, strange trip it's been! *Remedial and Special Education, 19*(4), 219-228.